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IV

EXPEDITION TO THE REVILLAGIGEDO ISLANDS, MEXICO, IN 1925, IV

A PLIOCENE FAUNA FROM MARIA MADRE ISLAND, MEXICO[1]

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In the course of the expedition of the California Academy of Sciences to the Revillagigedo and Tres Marias islands, Mexico, a marine Pliocene formation was found on the island of Maria Madre, of the Tres Marias group, and from it a small fauna was obtained. The collection was made by Dr. G. Dallas Hanna, curator of Paleontology, and the present senior author. The limited time available permitted only rather superficial collecting, and observation of no more than the most general geologic relations.

Maria Madre Island lies off the west coast of Mexico in approximately 21° 35′ north latitude, almost directly west of San Blas. It is about 55 miles from the nearest point on the mainland. The island is the largest of the Tres Marias group, which forms a chain having a general northwest and southeast trend.

Maria Madre Island consists essentially of a core of igneous rocks, chiefly granite, with some diorite and rhyolite, over-

[1]This paper is No. 4 of the Revillagigedo Islands Expedition of 1925. No. 1 contains the General Report; No. 2 gives an account of the Diatoms collected; and No. 3 is devoted to the Reptiles obtained. See pages 1-208 of this volume.

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lain unconformably by marine Tertiary sediments in which both Miocene and Pliocene are definitely recognized. A considerable development of Marine Pleistocene is found at the southern end of the island.

Miocene beds, according to Dr. Hanna, are well exposed in the Arroyo Hondo several miles upstream from its mouth near the northeast corner of the island. According to his statement, the section consists of about 1000 feet of soft white diatomite, almost pure, and superficially in every way similar to the Miocene diatomites of California. Fish remains are abundant in these beds, but no other megascopic fossils were found.

Pliocene beds apparently cap the greater part of the island. Along the eastern shore these attain a thickness of possibly 300 to 500 feet. In the central, higher regions the older rocks are commonly exposed in the cañons, but thin residual masses of Pliocene remain on the mountain tops. The beds appear to be moderately folded, with a general dip away from the central mountain core.

According to Dr. Hanna, an angular unconformity exists between the Miocene and Pliocene beds in the Arroyo Hondo; the dip of the Miocene beds is about 30°, and that of the Pliocene beds about 15°.

Lithologically, the Pliocene rocks exhibit considerable variation. They are most commonly represented by a loosely consolidated calcareous rock composed of a mixture of coarse sand and pebbles, and excessively abundant tests of foraminifera. Fossils are generally distributed in these beds, but the preservation is rarely very good. Finer grained sandstones and shales are found in lesser amounts, which are likewise rich in foraminifera but contain few larger fossils. Large blocks of reef coral are irregularly distributed in the formation. The general character of the Pliocene sediments indicates that they were, in greater part, deposited in distinctly shallow water, possibly under truly littoral conditions.

Pleistocene sediments apparently compose the low flat near the salt works at the southern end of the island. These consist of beds of calcareous, very fossiliferous sandstone. The beds are nearly flat-lying and in vertical section are about one hundred feet thick.

Pliocene fossils were collected at the following points. The numbers refer to the catalogue of localities of the department of Paleontology of the California Academy of Sciences.

Loc. 937—Maria Madre Island, Tres Marias, Arroyo Hondo, near northeast corner of island; first exposure in stream bed upstream from mouth.

Loc. 938—Maria Madre Island, Tres Marias. Beach cliffs 200 yards south of mouth of Arroyo Hondo; dark gray shales.

Loc. 939—Maria Madre Island, Tres Marias. Cliffs about one mile south of and above village.

Loc. 940—Maria Madre Island, Tres Marias. Lighthouse Point, on shore about one mile southeast of village.

Loc. 941—Maria Madre Island, Tres Marias. Float in arroyo, three quarters of a mile north of village.

Loc. 942—Maria Madre Island, Tres Marias. Miscellaneous collections from Pliocene.

The following fauna was recognized from the above localities:

Foraminifera

Numerous species,
All localities.

Anthozoa

Solenastrea sp.,
Loc. 941.

Brachiopoda

Terebratalia sp.,
Loc. 941.

Mollusca

Leda sp.,
Loc. 938.
Ostrea chilensis Philippi,
Locs. 939; 940.
Ostrea conchaphila Carpenter,
Locs. 939; 940.

Ostrea cumingiana Dunker,
Locs. 937; 939; 942.
Ostrea megodon Hanley,
Locs. 939; 942.
Ostrea vespertina Conrad,
Locs. 937; 939.
Pecten (Pecten) stearnsii Dall,
Loc. 937.
Pecten (Chlamys) dallasi Jordan & Hertlein,
new species,
Loc. 937.
Pecten (Patinopecten) near *caurinus* Gould,
Loc. 939.
Pecten (Lyropecten) subnodosus Sowerby,
Locs. 937; 939.
Pecten (Plagioctenium) circularis Sowerby,
Loc. 937.
Pecten (Plagioctenium) abietis Jordan & Hertlein,
new species,
Locs. 937; 939.
Pecten (Plagioctenium) invalidus Hanna,
Locs. 937; 939; 942.
Placunanomia cumingii Broderip,
Locs. 939; 942.

Cirripedia

Coronula cf. *diadema* Linnæus

This faunal list, while not large and unquestionably not complete for the formation, is extremely important, since its affinities are western North American, and Maria Madre Island is the southernmost point from which such a fauna has yet been reported. A large majority of the species occur in the Pliocene of Southern or of Lower California. None shows relations with either the Caribbean,[2] Panamanian, or Peruvian provinces.

The composition of the fauna indicates an upper Pliocene age, certainly no older than the Pliocene of Cedros Island, Lower California, and the San Diego formation of Southern

[2] *O. megodon* of the present fauna has been reported from the Tertiary of the Caribbean region.

California. The beds are not far removed in age from the upper Pliocene of Loreto, San Antonio Point, San José Island, and San Marcos Island, in the Gulf of California region, although the exact stratigraphic position of those beds is not yet known.

By far the greater part of the fauna is composed of Pectens, which, as a whole, indicate a warm temperate climate at the time of deposition of these beds.

1. **Pecten (Chlamys) dallasi** Jordan & Hertlein, new species

Plate XXIII, figures 2, 5, 6, 8

Shell of medium size, moderately thick, in several specimens with strong lines of restricted growth; valves mildly arched, and slightly extended posteriorly; hinge line a little over half the total length of the disk. Right valve ornamented by about 15 to 19 almost flat-topped radiating ribs, separated by slightly rounded interspaces almost as wide as the ribs, the summit of the ribs smooth, the sides and interspaces sculptured by fine, sharp, subequal radiating ridges and grooves, the shoulder of each rib on either side marked by a deeper groove; anterior dorsal and posterior dorsal areas of disk smooth; ears unequal, the anterior with a well developed byssal notch and sculpture consisting of about six radiating riblets crossed by concentric lines of growth; posterior ear obliquely truncated behind, and ornamented by four or five radiating riblets between which the interspaces bear fine incised radiating lines. Left valve sculptured much as right; anterior dorsal and posterior dorsal margins of disk sloping more abruptly to base of ears than on right valve; anterior ear indented by a rounded byssal notch and ornamented by five radiating riblets between which are minute sharp radiating grooves; posterior ear obliquely truncated and sculptured much as anterior, the radiating riblets, however, much more subdued and less prominent. Height 42 mm.; length 43 mm.; diameter 13 mm.; apical angle approximately 105°.

Type: No. 1862, *paratypes* Nos. 2072, 2073, 2074, 2075, 2076, and 2077, Mus. Calif. Acad. Sci., from Loc. 795 (C.A.S. coll.), **Cañons one or two miles from San Antonio Point, east coast of Lower California**; upper Pliocene; Fred Baker col-

lector; also No. 2078, Mus. Calif. Acad. Sci., from Loc. 937 (C.A.S. coll.), Arroyo Hondo, Maria Madre Island, Mexico; upper Pliocene; G. Dallas Hanna and Eric K. Jordan collectors.

Pecten dallasi is easily recognized by the peculiar minor radiating sculpture superimposed on the major ribs and interspaces. The number of ribs varies considerably, as does the obliquity of the valves.

This species is abundant in the upper Pliocene of the Gulf of California region, and, as we have specimens from there in better state of preservation than those from Maria Madre Island, the type is selected out of a lot from Lower California. The collection from Maria Madre contains three specimens of the species. The writers wish to express their obligation to Dr. Fred Baker, who collected the type specimen.

The species is named in honor of Dr. G. Dallas Hanna, whose work on the Pliocene of Imperial County, California, and on Lower California has added to our knowledge of the region.

2. **Pecten (Plagioctenium) circularis** Sowerby

Plate XXIII, figure 9

A specimen of this species, from the Pliocene of Maria Madre Island, is illustrated to show the characteristic narrow ribs with broad interspaces, in contrast with the ribbing of *P. abietis*.

3. **Pecten (Plagioctenium) abietis** Jordan & Hertlein, new species

Plate XXIII, figures 1, 3, 7

Shell averaging about 45 millimeters in altitude, about as long as high, fairly thick and solid, somewhat produced posteriorly. Right valve ornamented by 19—21 subtriangular ribs, in adults becoming flattened toward the margin, separated by sharp, narrow-bottomed interspaces, the sides of the ribs and interspaces decorated by sharp, close-set fringing lamellæ; hinge line about two-thirds the length of disk; ears about equal in length, rather large, the anterior ear ornamented by about four rather faint radial ribs crossed by concentric lines of growth, the byssal notch well defined; posterior ear faintly

radially and concentrically sculptured. Left valve with the ribs more pronouncedly triangular in cross-section, the sides densely fringed with lamellæ; ears similar to those of right valve, but the byssal notch on anterior ear less developed; hinge strong; cardinal crura well developed. Altitude 45 mm.; longitude 46 mm.; diameter of left valve about 32 mm.; apical angle about 100°.

Type: Left valve, No. 2079, *paratypes* Nos. 2080, 2081, 2082, and 2083, Mus. Calif. Acad. Sci., from Loc. 937 (C.A.S. coll.), **Arroyo Hondo, Maria Madre Island, Mexico**; upper Pliocene; Hanna & Jordan, collectors.

This species is closely related to *P. circularis*, but is distinguishable by the character of the ribbing. The ribs of *P. abietis* are wide at the base, and are triangular or subtriangular in cross-section. The interspaces are very narrow, and the sides of the ribs and interspaces are covered by a dense fringe of concentric lamellæ. The ribs of *P. circularis* are distinctly rounder and much narrower in cross section, and the interspaces are much wider.

Examination of a large series of specimens from Maria Madre Island, where this species is very abundant, and also from various localities in the upper Pliocene of the Gulf of California region, shows the angularity of the ribs to be a constant characteristic. The writers realize that intergradation with *P. circularis* proper may ultimately be proved, but as yet the present species is known only from the subtropical Pliocene.

The name *(abietis,*—of the fir) refers to the dense fringes of lamellæ, like needles of a conifer.

4. **Placuanomia cumingii** Broderip

Plate XXIII, figure 4

Placuanomia cumingii Broderip, Proc. Zool. Soc., 1832, p. 29.—Reeve, Conch. Icon., Vol. 11, 1859, *Placuanomia,* pl. 1, figs. 3a, 3b.

This species has never previously been figured in any generally accessible publication. It has not heretofore been reported from the Pliocene.

P. plicata Tuomey & Holmes, from the Pliocene of South Carolina, is hardly distinguishable from this species.

Plate XXIII

Fig. 1. *Pecten (Plagioctenium) abietis* Jordan & Hertlein, new species; natural size; type, left valve, No. 2079, Mus. Calif. Acad. Sci.

Fig. 2. *Pecten (Chlamys) dallasi* Jordan & Hertlein, new species; natural size; paratype, right valve, No. 2072, Mus. Calif. Acad. Sci.

Fig. 3. *Pecten (Plagioctenium) abietis* Jordan & Hertlein, new species; natural size; paratype, right valve, No. 2080, Mus. Calif. Acad. Sci.

Fig. 4. *Placunanomia cumingii* Broderip; natural size; plesiotype, No. 2084, Mus. Calif. Acad. Sci., from Loc. 939 (C.A.S. coll.), Cliffs about one mile south of and above village, Maria Madre Island, Mexico; upper Pliocene.

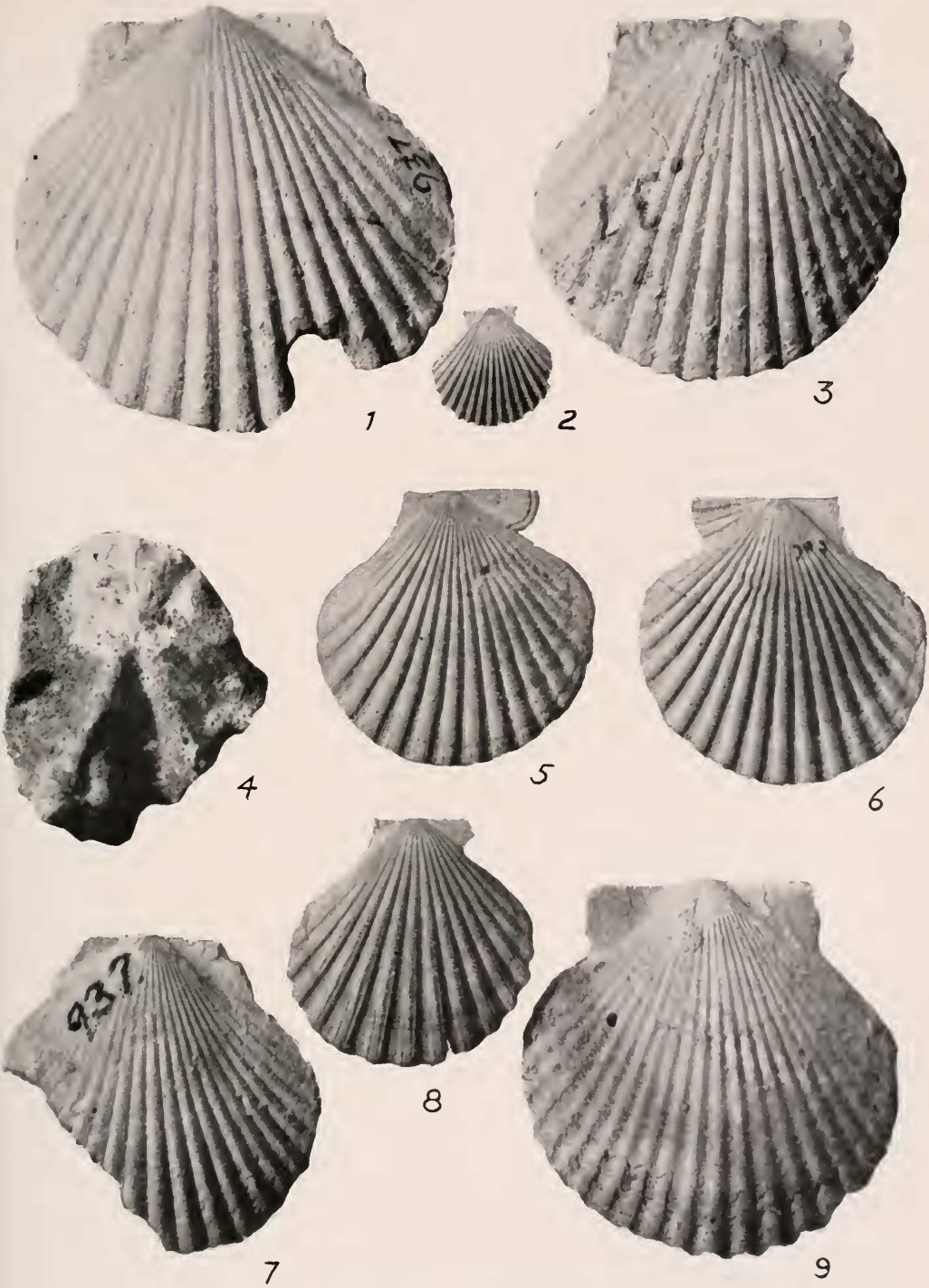
Fig. 5. *Pecten (Chlamys) dallasi* Jordan & Hertlein, new species; natural size; type, right valve, No. 1862, Mus. Calif. Acad. Sci..

Fig. 6. *Pecten (Chlamys) dallasi* Jordan & Hertlein, new species; natural size; type, left valve. Same specimen as Fig. 5.

Fig. 7. *Pecten (Plagioctenium) abietis* Jordan & Hertlein, new species; natural size; paratype, left valve, No. 2081, Mus. Calif. Acad. Sci.

Fig. 8. *Pecten (Chlamys) dallasi* Jordan & Hertlein, new species; natural size; paratype, right valve, No. 2073, Mus. Calif. Acad. Sci.

Fig. 9. *Pecten (Plagioctenium) circularis* Sowerby; natural size; plesiotype, left valve, No. 2085, Mus. Calif. Acad. Sci., from Loc. 937 (C.A.S. coll.), Arroyo Hondo, Maria Madre Island, Mexico; upper Pliocene.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